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(54) Title: COATING COMPOSITION AND PROCESS (57) Abstract An aqueous composition, comprising an aluminozirconate complex and a film-forming polymer, is useful in reducing long term deterioration of metal surfaces, particularly the exposed surfaces of zinc galvanised steel panels or sheets.		

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⁺ Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

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Coating composition and process

This invention concerns a composition for coating metal surfaces and to a process for coating metal surfaces.

In the manufacture of zinc-, zinc alloy-, aluminium- or other metal-coated metal articles or sheet, or articles or sheet of aluminium, aluminium alloys, copper, copper alloys, steel or of other metals or alloys, it is desirable to apply one or more protective coatings to the surface with a view to alleviating the problems of deterioration of the surface in storage and/or of the provision of an effective base for later painting, varnishing, priming, enamelling or like operations. It is to these problems that the invention particularly relates.

A zinc-coated steel surface, for example, has a tendency, if untreated, to develop a white coloured powdery deposit in storage, so-called "white rust", which detracts from the appearance of the surface and possibly adversely affects the key of paint and the like onto the surface.

European Patent Specification No. 356855 relates to the problem outlined above. That specification refers to the established usage of chromium compounds to achieve the inhibition of corrosion of aluminium and zinc, and cites the considerable problems of effluent monitoring and disposal and the need to take precautions to ensure the protection of plant operatives which arises from the extremely toxic nature of the chromium compounds. The specification teaches that certain aluminium-zirconium complexes may be used in place of the chromium compounds.

The approach disclosed in European Patent Specification No. 356855 derived from the earlier teachings in United States Patent No. 4650526 which utilised similar aluminium-zirconium complexes to treat metal surfaces which had

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already been subjected to a phosphating treatment to improve corrosion resistance, a purpose of the aluminium-zirconium treatment being to improve the adhesion of later siccative organic coatings to the phosphate-treated surface. The United States patent teaches the use of aqueous solutions containing 0.005 to 5% by volume of the commercial aluminium-zirconium complex product. In many instances the performance of the phosphated, aluminium-zirconium complex-treated metal surfaces were found to be inferior to that of chromated metal surfaces in respect of corrosion prevention and adhesion of alkyd paint films.

In order to improve the performance of aluminium-zirconium complex-treated metal surfaces European Patent Specification No. 356855 teaches the coating of the complex-treated surface, after rinsing and drying, with an aqueous solution, emulsion or dispersion of a film-forming agent, such as polyacrylic acid. The aluminium-zirconium complex is used at concentrations of 0.1% or 1.0% by volume of the commercial form, which contains 20-24% wt of the complex, and the organic film-forming composition in 0.5 to 1 g/l. It has been found, however, that the process described in the European patent specification may not provide adequate, long-term resistance to surface deterioration since the zircoaluminate coating tends to shrink on drying, before the film-forming agent is applied, leaving regions of the metal surface effectively untreated with complex.

According to the present invention it has been found that excellent corrosion prevention and adhesion properties may be obtained on the aforesaid metals, for example on phosphated or non-phosphated surfaces of zinc-, zinc alloy- or aluminium-coated metals, using a one-coat non-rinse process, by the use of a treating composition characterised in that the composition comprises an aqueous solution, emulsion or dispersion of an organic film-forming polymer and one or more aluminium-zirconium complexes. Galvanised steel panels coated with the compositions of the present invention demonstrate a long

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term resistance to surface deterioration commensurate with known chromium-based coatings. Further, the compositions of the present invention tend not to suffer the "shrinkage" problems associated with known aluminozirconate coatings.

Aluminium-zirconium complexes which may be utilised according to the invention are, for example, the reaction product of a chelated aluminium moiety, a zirconium oxyhalide and an organofunctional ligand. The organofunctional ligand is complexed with and chemically bound to the chelated aluminium moiety and the zirconium moiety.

The chelate-stabilised aluminium moiety has the general formula:



wherein

A and B are halo-, preferably chloro-, or hydroxy-,

"a" is a numerical value of from 0.05 to 2, preferably from 0.1 to 1,

"b" is a numerical value of from 0.05 to 5.5, preferably from 1 to 5,

"c" is a numerical value of from 0.05 to 5.5, preferably from 1 to 5,

provided that $2a + b + c = 6$, and

-OR¹O- is either an alpha-beta or alpha-gamma glycol group in which R¹ is an alkyl, alkenyl, or alkynyl group having from 1 to 6 carbon atoms, preferably an alkyl group and preferably having 2 or 3 carbon atoms; or an alpha-hydroxy carboxylic acid residue of the formula -OCH(R³)-COOH, where R³ is H- or an alkyl- group having from 1 to 4 carbon atoms, preferably from 2 to 3 carbon atoms.

The zirconium oxyhalide, preferably an oxychloride, has the general formula:



wherein

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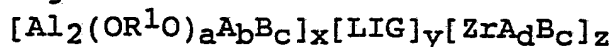
A and B are as defined for (I) above, preferably one of A and B is chloro- and the other of A and B is hydroxy-, and

"d" and "e" independantly have numerical values of from 0.05 to 4,
provided that $d + e = 4$.

The organofunctional ligand (LIG) is derived from one or more of the following:

- 1) an alkyl-, alkenyl-, alkynyl-, aryl- or aralkyl-carboxylic acid having from 2 to 36 carbon atoms, preferably from 2 to 18 carbon atoms, more preferably from 4 to 18 carbon atoms and even more preferably from 2 to 6 carbon atoms;
- 2) an aminofunctional carboxylic acid having from 2 to 36 carbon atoms, preferably from 2 to 18 carbon atoms, more preferably from 4 to 18 carbon atoms and more preferably from 2 to 6 carbon atoms;
- 3) a dibasic carboxylic acid having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms, and wherein both carboxy groups are preferably terminal;
- 4) acid anhydrides of dibasic acids having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms;
- 5) a mercapto functional carboxylic acid having from 2 to 18 carbon atoms, preferably 2 to 6 carbon atoms; and
- 6) an epoxy functional carboxylic acid having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms.

The aluminium-zirconium complex may be empirically represented by the general formula:



wherein A and B are as above-defined, and a,b,c,d and e are as defined above, except that, in order to form the bonds depicted, the substituents attached to the metal groups are appropriately reduced, i.e. $2a + b + c = 4$ ($2a + b + c = 5$ when the aluminium moiety is a terminal group), and $d + e =$

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2 ($d + e = 3$ when the zirconium moiety is a terminal group). When the aluminium moiety or the zirconium moiety terminates the above formula, one of the A or B groups may be replaced by a (C_1-C_6) alkoxy- group. x, y and z are independantly at least 1 and may vary from 1 to 100 or more. The molar ratio of x to z may vary from 1.5 to 10 with the preferred ratio being from 3 to 6 and the ratio of $(y/(2x + z))$ may vary from 0.05 to 3, preferably from 0.05 to 2.0, and more preferably from 0.1 to 0.5.

Methods for the preparation of the above described complexes are described in United States Patent Specifications No. 4539048 and 4539049, the disclosures of which are incorporated herein by reference.

Very suitably the aluminium-zirconium complexes utilised according to this invention may be those available under the Trade Name Manchem as about 20% to 25% vol solutions in polar solvents such as the lower alcohols, glycols, or glycol ethers of which suitable products are, for example, those designated APG-X, in which the carboxylic acid component is $NH_2-(CH_2)_2-COOH$, or CPG or CPM, in which the carboxylic acid components are $HOOC-(CH_2)_4-COOH$.

The organic film-forming polymer may be any polymer which is available as and curable in an aqueous solution dispersion or emulsion. Preferably, however, the film-forming polymer is selected from suitable vinyl polymers or copolymers, for example vinyl-acrylic copolymers, polyacrylic and polymethacrylic acids, and polyacrylates and polymethacrylates. The most preferred film-forming polymers are emulsions of acrylic copolymers such as those emulsions available under the Trade Name Neocryl (from ICI). Suitably such polymers may themselves contain corrosion inhibitors. A suitable solids content for the organic film-forming polymer is from about 30% to 50%, or even up to 75%, by weight.

The aluminium-zirconium complex may be present in the composition of the present invention in an amount of from 0.2% to 20% by

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weight based on the weight of the total aqueous composition although particularly successful results have been achieved using at least 5% by weight, for example 5 to 20% by weight, on the same basis. The film-forming polymer may be present in greater than 2%, for example from 2% to 20%, by weight of polymer solids on the same basis. A solution of the aluminium-zirconium compound in an organic polar water-miscible solvent may be mixed with the aqueous solution, dispersion, or emulsion of the film-forming polymer, preferably to give the above stated solids concentrations and the resulting product may therefore have a substantial content of said organic polar solvent.

Preferably, a substantial proportion of a silane, for example from 2 to 15% by weight of a commercial silane composition which may for example contain from 50% to 95% active material, based on the weight of the total aqueous composition, is included in the composition of this invention to increase the adhesion of subsequent organic surface coatings to the treated metal surface. Preferably the silane has alkoxy groups, preferably 2 or 3 such groups, hydrolysis of which will permit reaction with active sites on the metal substrate, and 1 or more organic groups capable of giving compatibility with the film-forming polymer and/or polymers present in subsequent surface coatings. Examples of suitable silanes are 3-aminopropyl-triethoxysilane, N-aminoethyl-3-aminopropyl trimethoxysilane and vinyl triethoxysilane which may suitably be in the form of 50% to 95% concentration products.

A small quantity of a defoamer and/or surfactant is also preferably included. A suitable quantity of each is about 0.01% to 0.5% by weight of the total composition may be used. Suitable materials may be that available under the trade name Bevaloid 6575M, polyoxyethylene-polyoxypropylene block copolymers, fluorosurfactants or non-ionic hydrocarbon surfactants.

When prepared for use in a dip tank, each litre of a preferred composition of the present invention will typically comprise from 20 to 200g, preferably 30 to 150g, of aluminium-

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zirconium complex and from 1 to 100g (polymer solids), preferably from 30 to 95g, of film-forming polymer.

The composition according to the present invention may be applied to the metal surfaces to be treated for example to a metal coil after hot dip or electrogalvanising or aluminium coating and after the temperature of the metal has fallen to below about 85°C preferably to below 80°C. The method of application may be by spray or by immersion with surplus liquid being removed, suitably by passing the metal between rollers or by the use of an air-knife. The metal may then be air or oven dried, for example at from 65°C to 85°C. The thickness of the coating is preferably up to about 50 microns, for example 1 to 10 microns which may be controlled by adjusting the solids concentration of the treating composition appropriately.

The coatings attained by the use of the present invention adhere strongly to the metal surface to which they are applied, help to retain the metal surface in bright, uncorroded form, and give a good key to subsequent surface coatings. Accordingly, the compositions of the present invention may suitably be used in or as coatings, such as primers or finishes.

These properties may be tested by the following tests.

- a) Salt spray corrosion test (ASTM B.117)
- b) Humidity test (1) BS.3900:Part F2:1973(1983).
 - resistance to humidity-cyclic condensation.
 - (2) BS.3900:Part F9:1982(1985)
 - resistance to humidity-continuous condensation.
- c) Stack test (Butler Building Test).

Stacking under artificially humid conditions provided by interleaved wetted filter paper for a number of days followed by a determination of the proportion of the area covered by white rust.

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- d) Adhesion test. BS.3900:Part E6:1974.
Cross cut test.

The invention will now be illustrated by reference to the following Examples and the drawings in which:

FIG 1 is a photograph of a galvanised steel panel treated in accordance with the process of EP-A-0356855 and illustrates the problems of "shrinkage" where the metal surface has dark and light regions indicating where the metal surface is coated with zircoaluminate composition or uncoated respectively.

Example I

Galvanised steel panels were treated with a composition according to the invention comprising water, 15% by weight of Haloflex vinylidene chloride copolymer (ICI), 10% by weight of a commercial vinyl triethoxysilane product, 5% by weight of Manchem APG-X zircoaluminate product and 0.5% by weight of Synperonic PE/L61 polyoxyethylene block copolymer (ICI). The composition was applied at 5%v/v concentration at 20 C by roller application to give an even film with a thickness of 5+/-2 microns (10-6m) after drying. The panels were (a) left unpainted or were coated with (b) a polyester or (c) an alkyd paint.

The panels were tested with the following results:

Test	Unpainted	Painted	
		Polyester	Alkyd
a) Salt spray	48 Hours >10% white rust	250 Hours pass	120 Hours pass
b) (1) Humidity	162 Hours <10% White	-	-

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rust

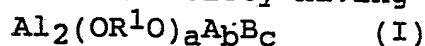
b)Stack	30 Days-pass b	-	-
test	<10% White		
	rust (galvanised		
	tube.		
c)Cross			
cut test	-	Class 0	Class 1
			Acceptable

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Claims

1. An aqueous composition for coating metal, eg zinc, copper, steel or aluminium, surfaces comprising:

1) an aluminium-zirconium complex which is the reaction product of a chelated aluminium moiety, a zirconium oxyhalide and an organofunctional ligand, the organofunctional ligand being complexed with and chemically bound to the chelated aluminium moiety and the zirconium moiety, the aluminium moiety having the general formula:



wherein

A and B are halo-, preferably chloro-, or hydroxy-,

"a" is a numerical value of from 0.05 to 2, preferably from 0.1 to 1,

"b" is a numerical value of from 0.05 to 5.5, preferably from 1 to 5,

"c" is a numerical value of from 0.05 to 5.5, preferably from 1 to 5,

provided that $2a + b + c = 6$, and

$-\text{OR}^1\text{O}-$ is either an alpha-beta or alpha-gamma glycol group in which R^1 is an alkyl, alkenyl, or alkynyl group having from 1 to 6 carbon atoms, preferably an alkyl group and preferably having 2 or 3 carbon atoms; or an alpha-hydroxy carboxylic acid residue of the formula $-\text{OCH}(\text{R}^3)-\text{COOH}$, where R^3 is H- or an alkyl- group having from 1 to 4 carbon atoms, preferably from 2 to 3 carbon atoms; the zirconium oxyhalide, preferably an oxychloride, having the general formula:



wherein

A and B are as defined for (I) above, preferably one of A and B is chloro- and the other of A and B is hydroxy-, and

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"d" and "e" independantly have numerical values of from 0.05 to 4,
provided that $d + e = 4$; and the organofunctional ligand (LIG) being one or more of the following:

(1) an alkyl-, alkenyl-, alkynyl-, aryl- or aralkyl-carboxylic acid having from 2 to 36 carbon atoms, preferably from 2 to 18 carbon atoms, more preferably from 4 to 18 carbon atoms and even more preferably from 2 to 6 carbon atoms;

(2) an aminofunctional carboxylic acid having from 2 to 36 carbon atoms, preferably from 2 to 18 carbon atoms, more preferably from 4 to 18 carbon atoms and more preferably from 2 to 6 carbon atoms;

(3) a dibasic carboxylic acid having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms, and wherein both carboxy groups are preferably terminal;

(4) acid anhydrides of dibasic acids having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms;

(5) a mercapto functional carboxylic acid having from 2 to 18 carbon atoms, preferably 2 to 6 carbon atoms; and

(6) an epoxy functional carboxylic acid having from 2 to 18 carbon atoms, preferably from 2 to 6 carbon atoms;

2) a film-forming polymer; and optionally

3) a silane.

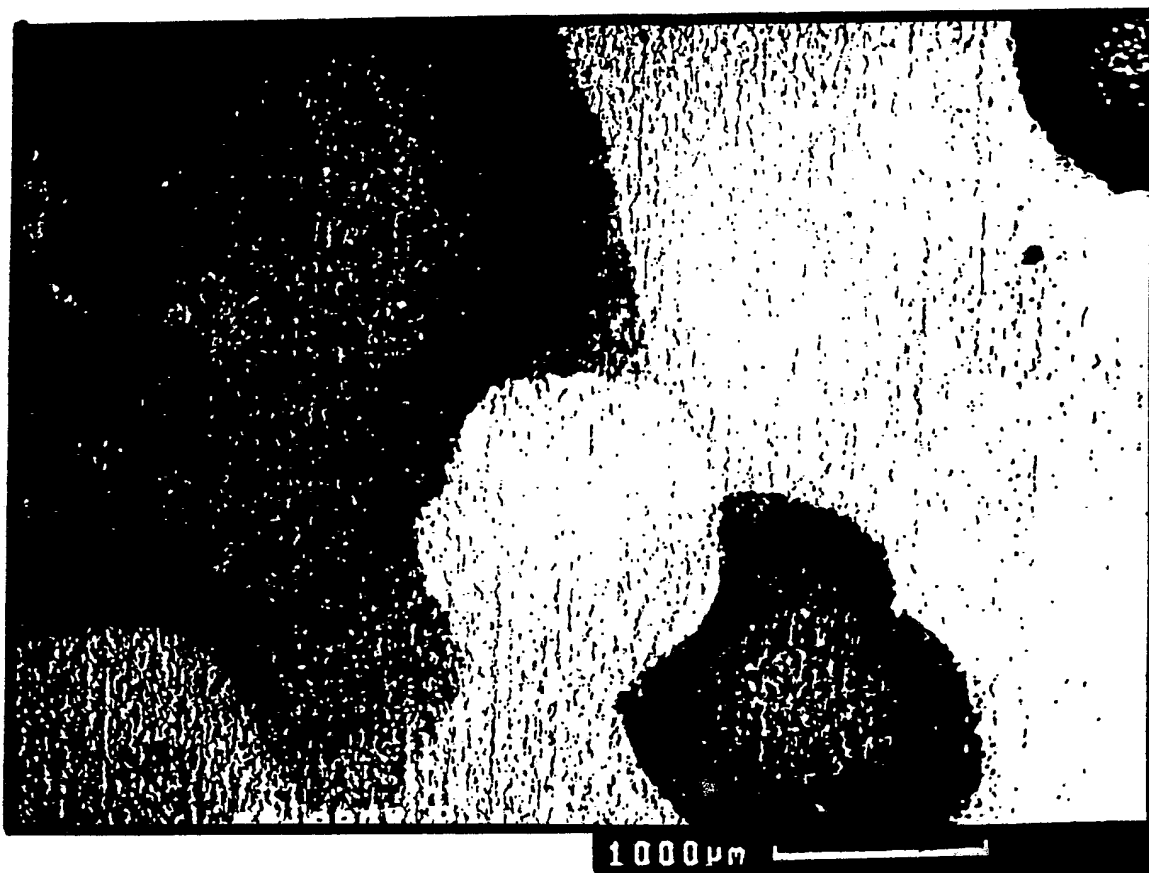
2. A composition as claimed in Claim 1, wherein component 1) is present in the composition in an amount of from 0.2 to 20% by weight of the total composition.

3. A composition as claimed in any one of the preceding claims, wherein component 2) is present in an amount of from 2 to 20 % by weight polymer solids of the total composition.

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4. A composition as claimed in any one of the preceding claims , wherein component 2) is selected from the group consisting of vinyl polymers or copolymers, (meth)acrylic polymers or copolymers, (meth)acrylate polymers or copolymers, and mixtures thereof.
5. Use of a composition as claimed in any one of claims 1 to 4 in or as a dip tank fluid for preventing corrosion of metal surfaces.
6. Use of a composition as claimed in any one of claims 1 to 4 in or as a metal primer.
7. A dip tank fluid, suitable for preventing corrosion of zinc galvanised steel, comprising an aqueous composition, each litre of composition comprising from 20 to 200g, preferably 30 to 150g, of an aluminium-zirconium complex as defined in claim 1, and from 1 to 100g (polymer solids), preferably from 30 to 95g, of a film-forming polymer.
8. A zinc galvanised steel article, e.g. panel, wire, tube, or plate, coated with a composition as claimed in any one of claims 1 to 4.
9. An aluminium article, e.g. panel, wire, tube, or plate, coated with a composition as claimed in any one of claims 1 to 4.
10. A metal primer comprising a composition as claimed in any one of claims 1 to 4.
11. A composition, method of application of a composition or use of a composition substantially as hereinbefore defined with reference to the examples.

FIGURE 1



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 91/01958

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 C23C22/68; C23C22/34; C09D5/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	C23C ; C09D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	EP,A,0 356 855 (GERHARD COLLARDIN GMBH) 7 March 1990 cited in the application see claims 1-12	1
A	EP,A,0 008 942 (UNION CARBIDE AGRICULTURAL PRODUCTS) 19 March 1980 see claims 1-3	1
A	DE,A,3 900 149 (KAO CORP.) 13 July 1989	
A	US,A,4 650 526 (WILLIAM J. CLAFFEY) 17 March 1987 cited in the application	
<p>¹⁰ Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
05 FEBRUARY 1992	20.02.92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	LANDAIS A.M. <i>Landais</i>	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 9101958
SA 53069

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0356855	07-03-90	DE-A- 3829154	01-03-90
		AU-B- 609327	26-04-91
		AU-A- 4080289	01-03-90
		JP-A- 2118081	02-05-90
		US-A- 5026440	25-06-91
EP-A-0008942	19-03-80	US-A- 4191596	04-03-80
		AU-B- 524774	30-09-82
		AU-A- 5056479	13-03-80
		CA-A- 1152666	23-08-83
		JP-C- 1275367	31-07-85
		JP-A- 55038997	18-03-80
DE-A-3900149	13-07-89	JP-B- 59049315	01-12-84
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		JP-A- 1177380	13-07-89
		JP-A- 1177381	13-07-89
US-A-4650526	17-03-87	US-A- 4978399	18-12-90
		None	

DERWENT-ACC-NO: 1992-200205

DERWENT-WEEK: 199334

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TITLE: Aq. compsn. for coating metal e.g. zinc@, copper@, steel and aluminium@ comprises aluminium zirconium complex comprising reaction prod. of chelated aluminium gp., zirconium oxyhalide and organo-functional ligand, and film forming polymer

INVENTOR: CLARKE N; MARSH C

PATENT-ASSIGNEE: OAKITE LTD[OAKI]

PRIORITY-DATA: 1991GB-020440 (September 25, 1991) , 1990GB-024474 (November 10, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
WO 9208822 A1	May 29, 1992	EN
AU 9188713 A	June 11, 1992	EN
ZA 9108867 A	June 30, 1993	EN
EP 556250 A1	August 25, 1993	EN

DESIGNATED-STATES: AU CA US AT BE CH DE DK ES FR GB GR IT
LU NL SE BE DE ES FR GB IT LU NL SE

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WO1992008822A1	N/A	1991WO-GB01958	November 7, 1991
AU 9188713A	N/A	1991AU-088713	November 7, 1991
EP 556250A1	N/A	1991EP-919619	November 7, 1991
AU 9188713A	N/A	1991WO-GB01958	November 7, 1991
EP 556250A1	N/A	1991WO-GB01958	November 7, 1991
ZA 9108867A	Based on	1991ZA-008867	November 8, 1991

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	C09D5/08 20060101
CIPS	C23C22/34 20060101
CIPS	C23C22/68 20060101

ABSTRACTED-PUB-NO: WO 9208822 A1

BASIC-ABSTRACT:

Aq. compsn. comprising (1) an Al-Zr complex, the reaction prod. of a chelated Al moiety, a Zr oxyhalide and an organofunctional ligand, the latter being complexed with and chemically bond to the chelated Al and Zr moieties, the Al moiety being $Al_2(OR_1O)_aAbBc$, A, B = halo (pref. chloro), hydroxy, a = 0.05-2, pref. 0.1-1, b, c = 0.05-5.5, pref. 1-5, provided $2a+b+c = 6$, -OR₁O- = alpha-beta or alpha-gamma glycol gp., R₁ = 1-6C alkyl, alkenyl, alkynyl, pref. 2-3C alkyl; or alpha-hydroxy carboxylic acid residue -OCH(R₃)-COOH, R₃ = H, 1-4C, pref. 2-3C alkyl; the zirconium oxyhalide, pref. oxychloride, = ZrAdBe, pref. A or B = chloro, the other = hydroxy, d, e = 0.05-4, provided d+e = 4; and the organofunctional ligand being one or more

of (i) 2-36C alkyl-, alkenyl-, alkynyl-, aryl-, aralkyl-carboxylic acid, pref. 2-18C, more pref. 4-18C, esp. 2-6C (ii) 2-36C aminofunctional carboxylic acid, pref. 2-18C, more pref. 4-18C, esp. 2-6C (iii) 2-18C dibasic carboxylic acid, pref. 2-6C, both carboxy gps. pref. terminal (iv) 2-18C acid anhydrides of dibasic acids, pref. 2-6C (v) 2-18C mercapto or epoxy functional carboxylic acid, pref. 2-6C; (2) a film-forming polymer opt. (3) a silane.

Also claimed are (a) Use of the compsn. in or as a dip tank fluid for preventing metal surface corrosion or as a metal primer. (b) A dip tank fluid, for preventing zinc galvanized steel corrosion, comprising an aq. compsn. comprising 20-200g, pref. 30-150g Al-Zr complex as above and 1-100g, pref. 30-95g, film-forming polymer/litre. (c) A Zn galvanised steel or Al article, e.g. panel, wire, tube or plate, coated with the above compsn. (d) A metal primer comprising the compsn.

USE/ADVANTAGE - The compsns. provide good corrosion prevention and adhesion properties to metal surfaces using a one-coat, non-rinse process. Galvanised steel panels coated with the compsns. have long-term resistance to surface deterioration without their toxicity

TITLE-TERMS: AQUEOUS COMPOSITION COATING METAL ZINC@
COPPER@ STEEL ALUMINIUM@ COMPRISE
ALUMINIUM ZIRCONIUM COMPLEX REACT PRODUCT
CHELATE GROUP OXYHALIDE ORGANO FUNCTION
LIGAND FILM FORMING POLYMER

DERWENT-CLASS: A82 E14 G02 M14

CPI-CODES: A08-M01C; A12-B04; A12-W12F; E05-B03; E07-A03B; E10-A25; E10-B02E; E10-C01; E10-C02D; E10-C04C; E10-C04D2; E31-C; E31-P06B; G02-A05E; M14-K;

CHEMICAL-CODES: Chemical Indexing M3 *01* Fragmentation Code
A313 A540 A940 A960 C000 C017 C100 C108
C710 C720 C801 C803 C804 C805 C807 F012
F100 G010 G020 G021 G040 G100 G221 H100
H181 H401 H402 H481 H482 H498 H721 H731
J011 J012 J013 J171 J172 J173 J522 L660 L930
M210 M211 M212 M213 M214 M215 M216 M220
M221 M222 M223 M224 M225 M226 M231 M232
M233 M262 M280 M281 M311 M312 M313 M314
M315 M316 M321 M322 M331 M332 M333 M342
M372 M381 M383 M391 M392 M411 M510 M520
M521 M530 M531 M540 M620 M630 M781 Q130
Q332 Q465 R023 Ring Index Numbers 00012
Markush Compounds 9224E2601 9224E2602

POLYMER-MULTIPUNCH-CODES-AND-KEY-SERIALS:

Key Serials: 0002 0013 0037 0069 0075 0205 0206 0209 0211
0218 0222 0224 0226 0231 0409 0410 0416 0417
0493 0494 0500 0501 0837 1279 1288 1590 1591
2307 2386 2427 2439 2654 2727 2728 3182 3240
3252 3293

Multipunch Codes: 02& 028 034 036 04- 040 06- 062 063 07& 071 074
075 076 077 081 09- 143 146 147 15- 198 20- 229
27& 28& 303 311 336 395 398 402 408 409 42- 431
44& 444 47& 477 51& 52& 53& 54& 546 575 596 597
600 656 688 720 001 003 006 007 020 020 020 021
021 022 022 022 023 040 041 041 041 049 049 050
050 083 127 128 159 159 230 238 242 243 265 272
272 318 324 325 329

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: 1992-091169